UCRL-JC-125406 Abs

Abstract submitted to the Radiative Properties of Hot Dense Matter
4-8 November 1996 Santa Barbara, California

Opacity Measurements: Extending the Range and Filling in the Gaps *

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Point projection backlighting techniques have been successfully applied to obtain opacity measurements in the XUV and hard X-ray regimes for isolated temperature and density conditions of different Z elements. Obtaining these measurements has required careful design of the target and refinements of experimental techniques to obtain data with sufficient temporal and spatial resolution to permit comparisons with calculations. We are presently performing a more systematic scan of the opacity. In particular, we are targeting plasma conditions where calculations are complex and not well benchmarked.

The current series of experiments explore Ge opacity at temperatures where the M-shell is almost filled. These data are obtained at lower temperatures than previously explored and allow us to investigate the role of atomic structure calculations and their impact on opacity data and scalings. The experiment uses the Nova laser to irradiate a gold hohlraum within which a CH-tamped Ge sample is radiatively heated. A Nd backlight probes the sample 2 ns later to produce Ge spectral absorption features in the 1.2 - 1.5 keV energy range. Temperature is monitored by the use of an Al dopant and density is monitored by measuring the edge-on expansion of the sample. Temporal resolution of ~ 200 ps is obtained by using a short pulse backlight. Calculations in this region show significant changes in the spectral features.

*This work was performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract No. W-7405-ENG-48.